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# American Cinematographer

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## **This Month**



**A Mid-Year Cinematographic  
Review—By Daniel B. Clark, A. S. C.**

**Trick Photography Methods  
Summarized — By Carl Gregory**

**Effect of Desensitizers in Devel-  
opment — By M. L. Dundon and  
J. L. Crabtree**

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# American Cinematographer

FOSTER COLE, Editor and General Manager  
C. K. PHILLIPS, Special Representative

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1219-20-21-22 Guaranty Building, Hollywood, California Telephone GRanite 5274  
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# Amateur Cinematography

## "Amateur" Camera is Carried to North Pole

Byrd and Amundsen Expeditions Take Bell and Howell Product over Pole; Motion Picture Records Made with Instrument.

Another triumph for the "amateur" model of motion picture camera was scored when the "Eyemo" was carried to and over the North Pole by the expeditions headed respectively by Lt. Commander Richard Byrd and by Raold Amundsen on the dirigible, "Norge."

### Historical

Newspapers throughout the country carried dispatches of motion pictures being taken of the North Pole on the occasion of the second time it was ever visited by a human being. The event is regarded as one of the most historical in the annals of the manufacture of motion picture equipment.

Similarly, the filming of the eruption of the Mauna Loa was done through the medium of the "Eyemo" which, it is stated, rendered possible International Newsreel's "scoop" on this happening.

### Expeditions

The "Eyemo" type of camera has been widely adopted for use in various expeditions, including the Third Asiatic Expedition, the Bering Sea Expedition, the Speer Expedition, the Smithsonian-Chrysler Expedition to Africa, the Wilkins North

## New Tripod Head



## Tripod Head for Small Camera

Fred Hoefner, of Hollywood, Perfects and Markets Device Especially Adapted to Amateur Motion Picture and Still Cameras; Larger Model for Professional Cameras to Be Forthcoming.

A new tripod head, adapted for the use of small amateur motion picture and still cameras, is announced in Hollywood by Fred Hoefner, precision mechanic, who is manufacturing the product under the patents of William Mauleby Thomas.

### Wide Range

Hoefner's creation is called the "True-ball Tripod Pole Expedition; and the African and Mongolian Expedition of the American Museum of Natural History.

Head." It is rotated on a true ball, and after being set up level can be tilted in a 90 degree arc and can be rotated 360 degrees.

The device allows the camera to follow any object, at the same time remaining level.

### Larger Model

It is said that this small model is to be supplemented by a larger one for professional size motion picture cameras. The professional model will have an independent tilt and pan.

# Cinematographer as Economy Unit in Production

Responsible Camera Artist  
Saves Salary in Course of  
One Picture



Great Economies Effected  
through Progress and Ef-  
ficiency of Camera Calling

(The following interview with Daniel B. Clark, president of the American Society of Cinematographers, was written by the editor of this publication for the studio section of the EXHIBITORS HERALD:)

The cinematographer is in a keystone post in the matter of effecting economy in cost of motion picture production, according to Daniel B. Clark, president of the American Society of Cinematographers.

## *Saves Salary*

"The cinematographer," Clark states, "ordinarily saves his salary many times during the course of the average production. This may appear to be a novel assertion; nevertheless, it is true.

## *Great Economy*

"In the matter of illumination alone, careful regulation by him as to how much light is used on each set, thereby employing only the light actually needed and avoiding over-illumination, is a means of saving hundreds of dollars on a feature production.

## *Promptitude*

"The company," Clark continued, "rarely has to wait for the cinematographer to be

ready to shoot. He is 'set up,' with all his lights arranged in proper positions, and waiting for the call, 'Camera,' when the director and the company are ready for action. If it were otherwise, it would mean, especially on sets with a great many extra people, the piling up of heavy overhead, due to the loss of time—for, need it be said that nothing can be done until the camera is ready to photograph? The cinematographer's alacrity in such matters is the result of the maximum efficiency to which he has reduced his work. Certainly a complete mastery of his subject is required for him, in the hurry and bustle of the set, to give commands as to where this light or that light is to be placed, all of which must be done in a few moment's time. What would have been the case if, in the beginning of the business, the procedure would have been established that a couple of hours or more would have been necessary for experimenting with and checking each array of lights, to determine its correctness?

## *Production Cost Cut*

"And so it is in the run of cinematographic improvements generally. The cine-

matographer has been quick to bring about or encourage such improvements, so that little corners, however imperceptible, are continually being cut in production costs. A faster or a more adaptable lens is immediately adopted, a new effect in miniature is worked out and so on—and hundreds of dollars and, in some instances, even thousands of dollars are saved for the producer. Thus, the expertness of the cinematographer brought the glass shot from the realm of probability to the plane of fact—and what producer doesn't realize the savings effected by this form of economy.

"These," the A. S. C. president concluded, "are but a few of the innumerable cases of cinematographic economies. Some rarely if ever come to executive attention, while others, because of their magnitude, command respect—as, for instance, the case in which one member of the A. S. C., is saving, it is reported, his company the sum of \$40,000 by having eliminated, in a big production now being made, the necessity of countless night shots—and previously it had been thought that the nights of photographing were an indispensable evil in the making of this particular picture."

# Effect of Desensitizers in Development

Part Two of Investigations  
on Photographic Develop-  
ers Is Released

By M. L. Dundon  
and J. I. Crabtree  
*Of the Eastman Research  
Laboratory.*

Paper Was Read at Spring  
Meeting of Society of Motion  
Picture Engineers

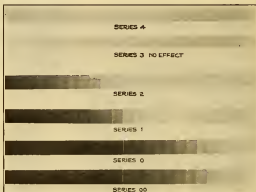


Figure Two—Relative photographic effect of Wratten safelights on Pan-chromatic film.

## I. INTRODUCTION.

The inspection of film during development is often desirable even though the time and temperature method can be used to produce negatives of a definite development contrast or gamma. Especially in the case of motion picture film, where only one positive material is used for printing all scenes, the production of negatives of fixed density contrast is desirable. In order to obtain this result the time of development must be varied according to the contrast of the original subject. Also, in ordinary photography, freedom of inspection during development may be of great assistance in obtaining the particular results desired.

## II. METHODS OF SECURING VISIBILITY DURING DEVELOPMENT.

The greatest possible visibility during development may be obtained by using an efficient safelight and by desensitizing the film.

### 1. Suitable Choice of Safelight.

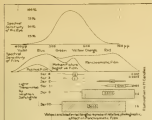
In selecting an efficient safelight there are two factors to consider, (a) the sensitivity of the eye to light of different colors and wavelength, and (b) the color sensi-

tiveness of the emulsion used. Mees and Baker<sup>1</sup> have explained this matter clearly and defined safelight efficiency as the product of the visual intensity of the light transmitted multiplied by its safety for a given emulsion. The relation of these factors is represented graphically in Fig. 1 where curves showing the special sensitivity of the eye and the special sensitivity of typical photographic emulsions are plotted on the same scale of wavelengths as the transmission of the Wratten safelights. From the upper curve<sup>2</sup> showing the spectral sensitivity of the eye it is evident that at a given intensity of radiation, the human eye is much more sensitive to green or yellow than to red or blue light. In fact the average point of maximum visibility for a large number of observers was at 560 mμ.

Ordinary photographic emulsions, on the other hand, are sensitive only to the blue and violet, but when made antichromatic they are sensitive also to green, and when panchromatic the sensitivity includes the red and is ex-

<sup>1</sup> L. E. M. Mees and J. K. Baker, "A Measurement of the Efficiency of Dark Room Filters," *Phil Jour* 47, 267 (1907).

<sup>2</sup> E. S. Gibson and E. F. T. Tyndall, "Visibility of Radiant Energy," *Sci Paper, Bur Standards* No. 474.



Above: Figure One. Curves showing relation between visual and photographic intensity of light transmitted by Wratten safelights.

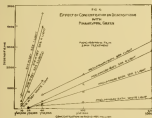


Figure Four

tended throughout the visible spectrum. The light transmitted by the Wratten Safelight Filters is represented in this diagram by blocks of which the extent of the base line corresponds to the wavelengths transmitted. The area, and the accompanying number, represent the relative photographic effectiveness of the light. This was measured by the effect produced on a panchromatic film when exposed to the different safelights for the same time through a step tablet (See Fig. 2). On the right are given the values in foot candles for the illumination given by the safelights and measured at a distance of 1 foot (30 cm.) when used in a Wratten safelight lamp containing a 25 W. bulb. The measurements were made with a Macbeth illuminometer. From this diagram it is evident that the yellowish green safelight, Series 3, is the most efficient for panchromatic materials, while for emulsions which are not red sensitive the red safelights Series 1 or 2 are better because of the relative insensitivity of the film to the light which they transmit. The extent to which these relations are modified by the use of sensitizers in development will be indicated later.

In Fig. 2 is shown the method by which the relative photographic effect of the light transmitted by the different safelights was measured. A step tablet having a density range of 3.4 was placed over a sheet of Commercial Panchromatic Film. Narrow strips were then exposed to each of the different safelights for the same time and in the same manner, and the whole sheet developed.

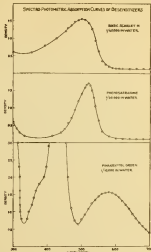


Figure Three

From the densities of the step tablet corresponding in each case to the first visible image, the relative exposures were calculated.

The limits of safety in exposing Eastman Motion Picture Negative and Commercial Panchromatic Film to the various safelights is shown in Table I. The fog density produced with normal development by a ten seconds' exposure to the safelight at a distance of one foot is given except where no effect was obtained in this time. In such cases the time required to produce a visible fog is recorded.

TABLE I  
COMPARATIVE SAFETY OF UNTREATED FILM TO WRATTEN SAFELIGHTS

Exposure at 30 cm. (1 ft.) from 8" x 10" Wratten Safelight Lamp Containing 25 W. Bulb.			
Relative Fog Density Produced by 10 seconds' Exposure			
Safelight Series	Panchromatic Film.	Motion Picture Negative Film.	
00	2.2	1.9	
0	2.0	1.2	
1	1.5	Fog in 1 minute	
2	1.5	Fog in 2 minutes	
3	0.2	Fog in 15 seconds	
4	1.0	0.8	

From Table I it is evident that sufficient light cannot be used with panchromatic film without desensitizing.  
(Continued on Page 18)

# A Mid-Year Cinematographic Review

President of A. S. C. Writes  
on Important Advances Dur-  
ing Last Twelve Months

By  
**Daniel B. Clarke**  
A. S. C.

Takes Stock of Progressive  
Steps since Last 'Directors'  
Number' of Film Daily

(The following story was written by Daniel B. Clarke, president of the American Society of Cinematographers, for the "Directors' Number" of the Film Daily.)

It is an unusual twelvemonth indeed that does not bring about an abundant measure of progress in the world of cinematography. Such progress is stimulated not only by the interest of the cinematographer himself in his work, but is substantially brought about by the wishes and demands of the director who is an exponent of things progressive in the field of motion photography.

## *Director's Encouragement*

A director may want a new bit of treatment, either for a novel result or for the same result produced in a different fashion, and it remains for the cinematographer to fill the order. Thus have many improvements been introduced in cinematography.

The year that has passed since the appearance of the last "Directors' Number" of the Film Daily has contributed its share toward the general photographic advancement of the industry, records of the American Society of Cinematographers show.

## *Small Cameras*

Unusual activity has been manifested in the matter of small motion picture cameras of the "amateur" variety. While these instruments have been designed primarily for the wide usage of the novice, they have found their way to the professional motion picture studios. Naturally, the small cameras which do not use the standard size of film are not so adaptable for professional use where the standard negative is imperative. But a portable camera such as the "Eyemo," which is a development of the Bell and Howell company, has been widely adopted for use among recognized cinematographers. Where heretofore, on some precipitous location or in exceedingly close quarters, the director had to forego his desire for an intimate shot of the action because of the size of the regular professional camera, the cinematographer now utilizes his small portable camera with results that are the joy of all concerned.

## *A. S. C. Member's Invention*

Another development which is meeting with marked interest among cinematographers is the invention of John W. Boyle, a member of the American Society of Cinematographers. Mr. Boyle has created an adapter whereby a regular standard camera head may be mounted, in a vertical tandem position, atop a camera of the Akeley type, the two being operated at the same time. The arrangement makes possible a "close-up" and "long-shot" of the same subject of action—a matter which has intrigued the film production imagination for some time.

## *"Talking" Films*

Since the Edison days in motion pictures, "talking" films have commanded perennial attention. Aside from the continuation of experiments on the already acknowledged species of cinema in this line, the Triergon method was announced during the past year in this country, preceded, according to the statistics which were cited, by more or less exhaustive trial exhibitions in Germany. The most recent contribution to this subject is the activity of Warner Brothers. E. B. Du Par, a member of the A. S. C. and a cinematographer on the staff of the Warner studios, is at present in the East working on the latter invention.

The matter of embodying speed into the negative through fast lenses and film has met with steady advancement during the past year. Panchromatic film is more popular than ever, and an "infra-red" stock, treated by Technicolor, has been used for special purposes. The actual taking speed of motion pictures, however, remains at a basis of sixty feet per minute, as re-affirmed by the American Society of Cinematographers and the Society of Motion Picture Engineers.

## *Color*

In the color division of cinematography, Technicolor remains in the van. "The Black Pirate" is generally heralded as the best that has been done by this method. There seems to be little question in Hollywood that a new vista was opened in this work by virtue of the lighting and other methods employed by Henry Sharp, who was chief cinematographer on the Douglas Fairbanks production.



## *Blue, red, yellow, green*

In photographing brilliant costumes, colorful sets, vivid landscapes Eastman Panchromatic Negative enables you to keep *all* colors—blue, red, yellow, green—in their correct relationship in black and white tones.

For photographing such subjects Eastman Panchromatic Negative is essential; for everyday use in the studio and on location it is invaluable.

Write for the booklet "Eastman Panchromatic Negative Film for Motion Pictures". Properties, uses, handling, development of the film are described.

*Motion Picture Film Department*

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EYEMO Camera carried by Lt.  
Commander Byrd on  
Polar Trip.

### Another "Scoop" for EYEMO

*Hawaiian Volcanic Disaster Filmed*

All the world has read of the outbreak on April 10 of the Volcanic Eruption on the top of Mauna Loa in South Koa, and of the havoc it caused in the village of Hoopulu which was completely destroyed by the molten lava flow.

Following the eruption word was received that the entire disaster had been "shot" with two EYEMO Standard Automatic Cameras—the only motion pictures taken—and that the films were being shown by the International Newsreel Company on the public screens of the world.

The filming of the Volcanic disaster was a tremendous scoop for the International Newsreel Company—one of the biggest in the history of their business. EYEMO made this scoop possible.

Still another "beat" for EYEMO was the filming of the ill fated "Antinoe" which was shot from the deck of the rescue ship President Roosevelt by an EYEMO Cinematographer.

### Many Famous Expeditions Equipped with EYEMO

*Below are some of the many famous expeditions now using the EYEMO Standard Automatic Camera.*

- |  |                       |
|--|-----------------------|
| The Third Asiatic Expedition   | Speerjux Expedition   |
| Byrd Polar Expedition  | Bering Sea Expedition |
| Amundsen-Ellsworth North Pole Expedition                                   |                       |
| Smithsonian-Chrysler Expedition to Africa                                  |                       |
| Wilkins North Pole Expedition—with Mr. Rossman                             |                       |
| United States Dept. of Interior, Geological Survey (Alaskan)               |                       |
| African and Mongolian Expedition of the American Museum of Natural History |                       |

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### EYEMO Visits the Pole with Byrd and Amundsen

When Lt. Com. Byrd, who guided the now famous airplane "Josephine Ford," left on his trip to circle the North Pole, he carried with him an EYEMO Standard Automatic Motion Picture Camera. He appreciated that a motion picture record was necessary to make the trip complete.

And now comes the word that Amundsen of the Amundsen and Ellsworth Polar Expedition, who closely followed Byrd, took along two of these standard automatic cameras. Tremendous scope for EYEMO!

### Chosen Because of Its Compactness

Both of these famous expeditions knew the advantages of compactness in a motion picture camera for the trip. So they chose EYEMO—the light weight, quick and ready standard film camera designed particularly for field and stunt use. Flexibility was another requirement. With EYEMO they had the photographic flexibility of a professional Bell & Howell Studio Model. And the camera had to be dependable for such an important trip. EYEMO'S dependability, they considered, was established by the 19-year reputation for quality of the company building and backing it.

As with Bell & Howell Professional Cameras, which are used almost exclusively by the foremost producers of the world, when there is an important picture to be taken, EYEMO Standard Automatic Camera is selected—indisputable proof of its superiority!

*The Pioneer, and The Standard by which all others are compared.*

*Bell & Howell Professional Cameras and equipment are used almost exclusively by the foremost motion picture producers of the world.*



## "Trick" Photography Methods Summarized

(Continued from Page 11)

got light photographed through a copper wire screen to give the shimmering rays which are shown in the conventional paintings representing this sacred history. The massive walls of Fort Schuyler furnished the walls of the City of Jerusalem and the Wise Men followed the Star on the backs of camels in the Bronx Zoo. Photographs of the pyramids were double exposed above a location on a sandy beach for the sojourn in Egypt and the pillared portico of a rich patent medicine manufacturers' home served as the architecture of the Roman Court.

### Great Demand

Nearly seven hundred prints from the original and two duplicate negatives which had to be made to supply the demand were sold and some of the prints are still listed by educational exchanges. Orders were still coming in when the negatives were destroyed in a disastrous studio fire.

### What Comedies Brought

Since the days of these crude pictures trick photography has waned and then revived strong again. For a long time it was the step-child of the legitimate producers. The comedy producers, however, have always regarded it as one of their strongest allies. It is, in fact, mainly due to the patient research of serious workers on the slap-stick lots that the credit for the present perfection of trick effects is largely due.

### Experts

Far sighted producers have awakened to the money savings that may be effected by the use of trick photography and now all the larger companies retain the services of high salaried experts who are specialists in the business of artistic photographic trickery.

### Stringent Requirements

Trick photography is a trick profession. It requires the arts of a trained magician with the added requirement that the spectator shall not even suspect that he is being deluded. Magicians must be familiar with psychology, with intricate mechanics, with higher mathematics, with physics, with art, with myriads of complicated details that must be made to dovetail to the fraction of a second. The craft of the trick cinematographer is just as exacting and calls for an even wider application of special and practical knowledge.

It is not my intention to give in this paper any detailed explanation of trick photography. The subject is far too broad to be covered, even in a large volume. Every piece of trick photography is a separate problem and, just as the combinations of the alphabet are practically infinite, so are the various combinations that may be arranged in doing work of this character.

Trick photography in cinematography is an analysis of motion in two or more directions. Simple cine analysis of motion is the series of frames or pictures the successive units of which represent phases of action at intervals of one sixteenth of a second. Most cine tricks require that two or more of these analyses be synchronized on one film and at the same time matched or blended with one another so that the line of demarcation between the two or more combinations be imperceptible to the eye even after the image is enlarged several thousand times on the theater screen.

In cases where the recording or taking interval of



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the combined components in the customary sixteen per second in each case, then the combination is not such a complicated problem as the written explanation makes it appear to be. It is very intricate, however, when the component members of the combination have to be taken at different rates of speed. In "The Last World" there were many scenes where the taking of the action of the prehistoric monsters required weeks and months of exposures made at comparatively long and irregular intervals. These stop motion exposures had to be synchronized and combined with the action of human characters whose movements, photographed at regular speed, occurred in a few seconds so that the composite result appeared to be simultaneous action. Not only was it necessary to synchronize the action but it was also necessary to reverse the apparent size of the objects so that the monsters, which were in reality miniature figures, seemed to be gigantic in comparison to the human actors.

#### Results

Trick photography thus does two tremendously important things for the industry: it renders possible the use of scenes and effects hitherto impossible of presentation and reduces enormously the cost of building elaborate sets. It also seems safe to prophesy that in the near future it will also eliminate the necessity for many exterior locations; particularly those to distant points where time and transportation are a large factor in production expense.

Let me outline roughly into a sort of general classification the various methods by which the trick photographer builds up his effects:

#### Stops

First, we have the basic standard of straight cinematography which consists of a series of frames or pictures taken at the approximate speed of sixteen exposures per second.

#### High Speed, Slow Motion

Second, high speed or slow motion photography in which the taking rate is considerably increased. For the laws governing the taking of miniatures by high speed photography to simulate action in the tempo of natural sized objects I refer you to the very excellent paper by J. A. Ball, entitled "Theory of Mechanical Miniatures in Cinematography," presented before the Society of Motion Picture Engineers at Roscoe, New York, May, 1924, and published in the Transactions of the Society.

#### Varied Taking Speeds

Third, time condensation or decreasing the taking speed to such an extent that movements which take place slowly and over so long a period of time as to be imperceptible to the human eye are made to appear to occur in a few seconds. This method is commonly used for showing the growth of plants, the germination of seeds, the erection or demolition of structures, etc. Slow cranking at slightly diminished speed is used to increase the speed of actors' movements for comedy effects and to speed up action in fights, races, and dramatic climaxes.

#### Animated

Fourth, trick crank or one picture turn. This is closely related to time condensation. The trick crank shaft is the one usually used for making time condensation exposures. The name "trick crank" comes down from the early days of cinematography because the single exposure shaft was often employed in making many of

(Continued on Page 18)

## E. Burton Steene

### Freelance Akeley Camera Specialist

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# DESENSITIZERS

(Continued from Page 18)

to inspect it satisfactorily during development, even though the sensitivity may be slightly decreased when wet with developer. Motion picture negative film, on the other hand can be inspected quite freely with a red light such as is given by the Series I safelight.

## 2. Desensitizing.

### A. Purpose of a Desensitizer

A photographic desensitizer is a substance which has the property of greatly diminishing the sensitivity of a photographic emulsion toward light action. To be of practical use in development it must not affect a latent image already present nor interfere with its subsequent development.

The most important reasons for using a desensitizer are, (a) to permit the inspection of panchromatic film during development, (b) to give much greater freedom in the use of safelights during the development of ordinary film, and (c) to prevent aerial or oxidation fog.

In a previous communication<sup>1</sup> it has been shown that the presence of a desensitizer in a concentration of 1,500,000 or even 1-1,000,000 in a developer which has a tendency to produce aerial fog, is sufficient to prevent such fogging action. This is of considerable value in the machine development of motion picture film, and for such use it has been found possible, by adding one part in a hundred thousand of phenosafranine, to use a dilute elon-hydroquinone developer with much less sulphite than would otherwise be necessary.

It has been stated in the literature<sup>2</sup> that in some cases a desensitizer also diminishes ordinary development or tank fog. This effect may be a decreased oxidation fog within the developer, but with certain developers tank fog is apparently diminished. This is discussed more fully in another section.

In the present paper it is proposed to show the extent to which the use of a typical desensitizer will permit greater safelight illumination during development.

### B. Methods of Use.

Desensitizing dyes are used either as a preliminary bath or in the developer itself. As a preliminary bath a concentration of 1-5000 or 1-10,000 is commonly used, and the film is dipped in the desensitizing solution for one or two minutes just previous to development. This operation must, of course, be carried out with proper safelights or in the dark.

When used in the developer the concentration usually recommended is 1-25,000 or less and the film is left in the developer for one or two minutes before exposing it to a safelight stronger than usual. In most cases the same concentration of dye desensitizes much more powerfully in the developer than in a separate water solution.<sup>3</sup>

### C. Considerations in Selecting a Desensitizer

Many dyes and other substances are known which greatly reduce the sensitivity of emulsions. However, in finding a substance suitable for practical use there are many factors involved, the most important of which will be considered briefly:

## 1. Desensitizing Power.

Desensitizing power is, of course, the first consideration. With desensitizers now known the speed of an ordinary fast emulsion to white light can be reduced several hundred times, while the decrease in sensitivity of panchromatic emulsions to certain safelights may reach several thousand times. Different desensitizers vary considerably in their ability to decrease the relative color sensitivity of panchromatic materials, and this variation also depends on the particular dyes used to give color sensitivity to the emulsion.

## 2. Effect on the Latent Image

To be of practical use a desensitizer must not remove to any extent a latent image already present on a film within a reasonable length of time. Most desensitizing dyes will destroy a latent image if the desensitized film is exposed to strong red light, and Carroll<sup>4</sup> has reported that pinkcrystal green will destroy a latent light image even in the dark if allowed to stand several hours before development. This fact has been confirmed in this investigation.

## 3. Effect on Development

Desensitizing dyes generally decrease the induction period of certain developing agents such as hydroquinone and pyro and so may change the Watkins factor of a developer. Some desensitizers retard development. It is, of course, desirable that the addition of a desensitizer shall not affect the time of development nor change the shape of the characteristic curve of the developed image.

## 4. Fogging Action.

Some of the most powerful desensitizing substances known, such as methylene blue, have an independent fogging action which entirely prevents their use for this purpose. No appreciable fogging action can be tolerated, although certain commercial desensitizers have a slight tendency in this direction.

## 5. Staining Action.

Some of the desensitizers in use stain not only the gelatin of the film and the trays in a very disagreeable manner, but also the fingers of the person who uses them. The stain is most persistent in the hardened gelatin on the back of a non-curling film. A desensitizer which does not stain gelatin or which washes out very easily is desirable.

The color or absorption region of the stain produced is also of importance because if it does not transmit blue light the printing time of a stained negative may be affected.

## 6. Color in Relation to Safelight.

If desensitized films are to be inspected by transmitted light during development the color of the desensitizer with which a film is stained must be such that it does not absorb the light transmitted by the safelight. Otherwise the whole film will appear fogged or too dense to examine satisfactorily. For instance, phenosafranine appears black in a green light and colorless in a red light.

## 7. Solubility in a Developer.

The concentration in which desensitizers can be added to a developer is often limited by the fact that they form an insoluble precipitate with certain developing agents, especially hydroquinone. In extreme cases a precipitate may form in an emulsion when it is put into a developer after a preliminary desensitizing bath.

<sup>1</sup> J. A. Hulse, "Contributions to Development in Bright Light," *Inst. Reel.*, 62, 114 (1925).

<sup>2</sup> J. H. Carroll, "Desensitizing and Photographic Reversal by Desensitizers," *J. Phys. Chem.*, 29, 692, (1925).

<sup>3</sup> J. Hulse, L. Dunder and J. E. Oakley, "Investigations on Photographic Developers. II. The FOGGING Properties of Developers," *Am. Phot. Ass. Trans.*, 1925, Rev. Photo. 3, 380 (1924); *Sci. Serv. Photo. B. E.* (1925); *J. Phot.*, 21, 261, 319, (1924).

<sup>4</sup> J. A. Hulse, "The Formation of Tank Fog," *J. Phot.*, 22, 185, (1925).

8. *Stability.*

Some desensitizers which are very effective as a preliminary bath are destroyed immediately by the sulphide, if added to a developer. The stability in a developer and the keeping property of the water solution when exposed to light and air are important factors.

9. *Speed of Action.*

Especially when a desensitizer is used in a developer the speed of the desensitization is important. Luppö-Cramer<sup>7</sup> has pointed out that while Rhoduline Red G is as strong a desensitizer as phenosafranine it takes twice as long to produce the same effect. This is probably due to a slower rate of diffusion through the gelatine.

10. *Availability and Cost.*

For general use it is obvious that a substance must be available at a reasonable price.

### III. COMPARATIVE PROPERTIES OF DIFFERENT COMMERCIAL DESENSITIZERS

1. *Phenosafranine.*

The first important member of this series is phenosafranine of which the desensitizing action was discovered by Luppö-Cramer and is described fully in his book on the Safranine Process.<sup>8</sup>

Many of the safranine dyes have a similar desensitizing action, but considering all its properties Luppö-Cramer considered phenosafranine to be the most generally useful of those which he examined. Phenosafranine has a strong desensitizing action, does not give trouble from fog, and is a well known and easily obtainable substance. It is perfectly transparent in a bright red light but has a dark appearance in a green light. It is less effective in desensitizing panchromatic materials such as Eastman Commercial Panchromatic Film than is pinkkryptol green. When used with an ordinary plate such as Eastman 40 it extends the spectral sensitivity through the green giving a maximum at 580 mμ. Phenosafranine forms a precipitate in developers containing hydroquinone to about the same extent as does pinkkryptol green but if added with care can be used in most elon-hydroquinone developers. In pyro developers it is distinctly less soluble than is pinkkryptol green.

The most serious objection to the use of phenosafranine is the intense stain which it imparts to the film, trays, and hands. When a film is thoroughly fixed in an acid fixing bath most of the dye washes out quite readily. However, any residual stain left in a negative has no effect on its printing time as phenosafranine transmits the violet light to which positive emulsions are most sensitive. When used in small concentrations to prevent aerial fog its staining action is not appreciable.

In Fig. 3 is shown the absorption spectrum of phenosafranine, in relation to that of pinkkryptol green and basic scarlet N.

2. *Panasafrin.*

Panasafrin is stated by Wall<sup>9</sup> to be safranine J IV or tetra methyl safranine. It is said to be a slightly stronger desensitizer<sup>10</sup> than phenosafranine but was stated by Luppö-Cramer to be less desirable for practical use (continued on page 22)

<sup>7</sup> Luppö-Cramer, "Protective Dyes in Development," Phot Ind. p. 157, 1922.

<sup>8</sup> Luppö-Cramer, Negative Development in Bright Light, The Safranine Process, 2nd Edition, Luppö, 1922.

<sup>9</sup> E. J. Wall, History of Three Color Photography, Boston, 1925, p. 240. This book also contains a very complete bibliography on desensitizing.

<sup>10</sup> Luppö-Cramer, "The Best Desensitizer," Phot Ind., 1925, p. 1226.

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Continued from Page 272

the trick effects mentioned in the first paragraphs of this paper.

Animated cartoons and diagrams are made by means of the trick crank and are, of course, trick photography. Nevertheless, in time nomenclature animated diagrams and cartoons are a classification separate from that of trick photography and, while most of the devices used by the animated cartoonist are also used in trick photography, the subject is too large to be treated in this paper. To those interested in the subject I refer them to the very able volume by E. G. Lutz, entitled "Animated Cartoons," published by Scribners.

The difference in time condensation and trick crank work is in the interval of the timing. In time condensation the interval is predetermined by the length of time in which it is expedient to show the resulting film. In trick crank work the successive phases of movement are artificially produced between exposure intervals so that inanimate objects may appear to be endowed with automatic powers. The time of exposure interval is therefore dependent on the time necessary to arrange the subjects into the successive phases of the simulated action.

Every move of every joint and limb of the prehistoric animals in "The Lost World" had to be thought out beforehand and a calculation of the amount of movement which would occur in each succeeding phase of one sixteenth of a second if the model were an actual animal with the bulk of several elephants.

#### Reverse Order

Fifth, reverse camera, or the showing of the series pictures of a motion analysis in reverse order. The effects produced by this method are too well known to describe them.

#### Mattes

Sixth, simple devices or attachments used mainly to alter the size and shape of the screen opening. These consist of masks or mattes of opaque or translucent material which either vignette the edges of the picture or produce silhouetted openings, to enhance the illusion of scenes which are supposed to be observed through an archway, a keyhole, a telescope, binoculars or other familiar officer. Previous papers presented before the Society describe these devices in detail.

#### Stop Motion

Seventh, stop camera and substitute which is one of the oldest and most familiar of trick devices. It was and is used mainly for magic appearances and disappearances. It consists in stopping the action and camera simultaneously and placing or removing the objects which are to appear or disappear.

Eighth, the fade and dissolve. This is similar to stop camera but is a gradual instead of an abrupt change. It is produced by diminishing the exposure to zero and then running the film back to the commencement of the reduced exposure and fading in or increasing the second exposure at the rate as the previous one was reduced, thus giving full exposure to objects which remained in the scene during the fade in and out, but gradually introducing or extinguishing the image undergoing the magical change.

#### Multiple Exposure

Ninth, double or multiple exposure. By this device dual roles can be played by a single actor. It consists of making off a portion of the picture frame and making one exposure, then winding the film back to the beginning

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and making the first exposure while the second one is made on the remaining unexposed portion of the frame. The frame may be divided in this manner as many times as is necessary to produce the effects desired. I have made multiple exposures where the film was run through the camera twenty-six times. Dual roles, visions and ghostly apparitions are produced in this method. Masks are not usually used for ghost effects. The first exposure without the ghost is made in the normal manner and the ghost, dressed in light colored clothing, is exposed over the first record by posing the ghost actor against a black drop or shadow box. The details of the first exposure register through the shadows of the ghost outline and give it the shadowy or spiritual quality which ghosts are supposed to possess. The chief difficulties in double exposure work are in the synchronization of action and the matching or blending of the edges of the masked sections so that the line of demarcation is indistinguishable.

### Gloss

*Teeth*, glass work, which is a variety of simultaneous double exposure. The term "glass work" originated because the first examples of this work were accomplished by painting portions of scenes on large sheets of plate glass. A piece of plate glass a little larger than the field of view of the lens at 50 or 12 feet from the camera is placed in a rigid frame parallel to the front of the camera. The field of action as viewed by the camera lens is left clear and no painting is done on this portion of the glass. Any section of the remaining portion of the picture composition, however, can be masked out and replaced by a painting, in accordance with the laws of perspective, of any kind of background or foreground that the production may require. With the use of this device it is necessary to build only such portions of a set as is required to form a background for the action while the remaining portion is supplied by the painting on the glass.

The ordinary two-inch cone objective lens at distances beyond ten feet is almost universal in focus; this brings the entire picture in focus and does not blur the painting even though it is close to the lens and the set is far away.

By use of miniature models built to scale almost any number of different setups may be made, but extreme care must be used in lining up the model with the actual set which it completes. In the "Hunchback of Notre Dame" the picture shows a full size reproduction of the Cathedral of Notre Dame in Paris and yet the actual construction of the set was only to the top of the entrance doors, the upper portion being supplied with glass work and miniature models.

### Mirrors and Prisms

*Elevenset*, simultaneous double exposure by means of mirrors and prisms. This is a reversal of the means by which two identical images are made with one lens in the color camera. By this reversal two images may be superimposed and photographed on the same frame simultaneously and as the two images may be independently focused much smaller models and paintings may be utilized than in the glass work process. It is even possible to use a motion picture, previously taken, for the background of the new composite, so that actors in the studio may be shown amid the waving palms of a background photographed in the Sahara desert. This method has lately been heralded as a wonderful German invention under the name of the Schauflein process but is antedated by

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second American actor, adding to him are David Hecely, F. South Darter and myself.

#### *Double Printing*

*Twelfth, double printing*, which consists of making a composite negative by duping from two or more specially prepared positives and masking devices, or in making a special positive from two or more negatives and then duping the result. This corresponds in principle to multiple exposure in the camera. It is usually used to superimpose dark images on high lighted areas, a thing which is difficult to do in the camera.

#### *Traveling Matte*

*Thirteenth, the traveling matte.* By this process figures in action may be superimposed against any background without being necessary to build any sets at all. It requires very accurate mechanism to make it and is patented. It is sometimes called the Williams process from the name of the patentee, Frank Williams. It consists in photographing the action against a white background. By over exposure and intensification a silhouette of the action forms a mask or traveling matte which is interposed between the printing light and the background negative while a print is made from it. This positive film is then run through the printing machine a second time in register with the action negative, thus printing in the details of the acting figures. From this double print a dupe negative is made for further printing. The offshoot print masks the places occupied by the action figures and the original action negative has a dense black ground which masks the background negative image when making the master positive.

#### *Projection Printing*

*Fourteenth.* Projection printing with separate positive and negative control. In this process the printing is not done by contact as in the ordinary printing machine but by projecting the image from the negative onto the positive. The movement of the negative and positive films is controlled by separate mechanisms so that by manipulation of the controls any combination of the negative action series can be recorded in consecutive order on the positive film. The action on the original negative can thus be stopped, accelerated, retarded or reversed on the positive and by multiple masking and printing several successive phases of action of the same moving figure may be shown on the screen simultaneously. Max Fleischer and Alvin Knechtel are exponents of this process.

#### *Other Method*

*Fifteenth.* Mechanical devices operated independently and not connected mechanically with the operation of photography or printing have not been considered as coming within the province of this paper. They are too numerous to even attempt their listing. It should be said in this connection, however, that the trick photographer leaves no stone unturned in seeking to produce the desired effect and any device which lends itself to his use is considered his legitimate ally.

## PROJECTION

(Continued from Page 21)

mechanical aptitude, a high degree of technical knowledge and a certain inherent talent for projection, itself. A projectionist may have a high degree of mechanical skill, he may be an expert electrician, he may have the basic knowledge of physics necessary for the intelligent solution of his many current and recurrent technical problems, he may be furnished with the best projection equipment that money can purchase, the conditions under which he is working may be perfect for expert screen results and, yet, unless he possesses a peculiar and intangible aptitude for the art of projection, itself, his results on the screen may be colorless and commonplace despite their theoretical perfection.

#### *Personality in Projection*

I have often challenged the statement that the personality of the projectionist cannot be built into his projection. It absolutely can be, providing he possesses the ability to do it. I do not mean to say that we can go into a theatre employing two shifts of projectionists and determine by casual observation of the screen which projectionist is on duty at the time. What I do mean is that if a projectionist of ability and skill and with a natural aptitude for the art is in charge of, or has supervision over, the projection room and is endowed with the faculty for developing the latent talent in his subordinates, then he can just as definitely build his personality into the picture as the musical director can build his into the orchestra.

#### *Intelligence Necessary*

This illustrates the importance of the personal equation in the projection room, the value of which has seemingly been generally underestimated by all except the most astute managers. Expert projectionists and supervisors of projection can not be turned out by any rule of thumb, laboratory, class room nor yet alone by practical experience in the field, itself. Of course, the basis of the qualifications for the expert projectionist is intelligence, and it is a sad commentary on things in general and projection in particular that conditions have been permitted to exist which have tended to greatly discourage the really intelligent man from entering this craft as a means of livelihood. Projection, in a short

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### *Manufacturers Aid*

Projector and lens manufacturers are now in a position to supply the projectionist with equipment which will enable him to get the utmost out of the present two-dimension picture. More important, still, the exhibitor is beginning to realize the necessity for expensive projection equipment and high grade lenses and is willing to buy them. A great step forward has been made by several exchanges in their method of checking the condition of their film, thus assuring that prints delivered to the projectionist are in proper condition for projection. The work of the Paramount exchanges along these lines has been especially notable and deserves the hearty appreciation of the industry as a whole. The effects of this work will be far reaching.

### *The Future*

These, and many other things, are indications of the change that is taking place in the standard of projection as practiced in this country. The possibilities in this field are

now attracting the favorable attention of the college trained man, and unless the average projectionist now employed in this work lays out for himself, and adheres to, an immediate and intensive course of study and application along technical lines, he will awake some day to discover that the whole structure of the craft has changed over night and that he is still living in the yesterday.

(Continued from Page 19)

tical use because it is not transparent in a red safelight. It has not been tested in this laboratory.

### 3. *Pinkakryptol Green.*

Pinkakryptol green has about the same general desensitizing power as phenosafranin but is more effective with panchromatic emulsions. It has no effect on the latent image when used immediately before, or during development, and does not affect the keeping properties of a developer.

It has a slight but distinct fogging action, however, and if used for too long a time or in too high a concentration as a preliminary bath undesirable fog may be produced. As ordinarily used this is not serious. The chief advantage of pinkakryptol green is the fact that it does not tend to stain gelatin and so washes out of the emulsions very easily. It is colorless in a yellowish green light and so can be used very advantageously to develop panchromatic films with the Series 4 Wratten Safelight. The



power, that it is no more soluble in hydroquinone or pyro developers, and that the persistence of the stain is about the same. As is indicated by its absorption spectra, Fig. 5, its stain has a greater tendency to retard printing than phenosafranine stain, but in the amount present in an ordinary fixed and washed negative such an effect is inappreciable.

#### 7. Aurantia.

Aurantia has been recommended by Lumiere and Seyewitz<sup>15</sup> especially for use with Autochrome plates. Its desensitizing power is far less than that of phenosafranine; it stains badly, and washes out slowly. Unlike most other desensitizers it can be added to a concentration as much as 1-500 without precipitating and for this reason may have some use in special cases.

#### 8. Miscellaneous Dyes.

A large number of dyes are known<sup>16, 17, 18</sup> which desensitize photographic emulsions but which are not practically useful because they produce some undesirable effect such as fog, stain, destruction of the latent image, or retardation of development. Notable among such substances is methylene blue which is a most powerful desensitizer than pinakryptol green, but which fogs<sup>19</sup> very badly. It has been stated<sup>17</sup> that methylene blue can be used in connection with another dye such as acridine yellow which retards the fogging action and still permits desensitizing. Other combinations suggested are rhoduline blue or rhoduline violet with acridine yellow. The methylene blue-acridine yellow mixture was tested and found to desensitize well without serious fog when carefully used. However, it has no advantage over other common desensitizers, as Luppo-Cramer<sup>20</sup> has also shown, and a mixture is certainly less desirable than a homogeneous substance.

Pinakryptol green was selected for studying the limits of safety in the use of a typical desensitizer because it appeared to be the most satisfactory in all respects of any desensitizer available at the time of this investigation.

### IV. METHODS USED FOR TESTING DESENSITIZING ACTION

#### 1. Tablet Exposures.

A step tablet was prepared which had 25 steps covering a density range from 0.14 to 3.40. Over this were placed narrow strips of the dyed gelatin filters corresponding to the Wratten safelights Series 00, 0, 1, 2, and 3. The strip on which white light measurements were made was covered with a neutral density of 2.30 in order to bring the exposure within the same range as those through the safelight filters.

Tests were made by soaking a strip of film in the solution to be tested, removing excess liquid by drawing it quickly across a piece of chamois stretched over a bottle, and exposing while wet through the tablet. Exposures were made in a cabinet lined with black cloth 50 cm. from a 200 W. tungsten lamp which had a candle power of 176 as used. Exposures for desensitized film were 5 minutes and for untreated film 10 seconds. The strips were developed for 10 minutes in an elon-hydroquinone tank developer<sup>22</sup> (NQ-80 tank), fixed, and washed.

From the last visible step on each strip relative exposure values necessary to produce a visible density were calculated. Comparison with the value for untreated film showed the relative sensitiveness for each treatment. With one exposure through the tablet, values could be obtained for white light and for each of the safelights mentioned

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above. By this method the measurements were made on an intensity scale instead of a time scale. The values obtained were subject to an error at least equal to the difference in exposure represented by one step on the tablet, which would be about 50%. Considering the enormous range in sensitivity covered, a difference of 100% would not be serious, however, as this would only mean that a film might have, for example, either 0.1% or 0.2% of its original speed. For practical use a margin of safety much greater than this should be allowed.

#### 2. Direct Exposure to Safelights.

In order to relate the results of the tablet exposure to practical darkroom conditions, the time required to fog desensitized film when exposed directly to the safelights was determined. Strips of film 10 cm. x 25 cm. (4" x 10") were dipped by stages into a desensitizing bath so that the different areas were on the solution 5, 3, 2, 1, and 1/2 minutes with an untreated portion left on the end. The strip was then wiped with a chamois, placed under the safelight to be tested, and an opaque slide moved across it in such a way that each of the above areas were exposed

15. A. and L. Lumiere and A. Seyewitz. *Experiences on Desensitization*. B. 2 Phot. 90, 111 and 378 (1911).

16. E. Heger and Hans Reinhardt. *Contribution to the Knowledge of Desensitizing Silver Gelatin Emulsion*. Zeit. Wiss. Phot. 23, 11 (1924).

17. J. O. P. Dunn. *Notes on the Action of Desensitizers in Photographic Development*. Science News, 1924, p. 2.

18. J. H. H. and J. H. H. *The Photographic Effect of Methylene Blue as an Admixture with*. Kolloid Zeit. 18, 289, (1924).

19. J. J. Christie. *The Development of Motion Picture Film by the Red and Tan Systems*. Trans. Am. P. Eng. 16, 192 (1925).

8, 4, 2, 1, and .5 minutes. The exposure was made at a distance of 30 cm. (1 ft.) from a Wratten Safelight lamp fitted with a 25 W. bulb. The values for the illumination in foot candles afforded by the different safelights under these conditions are given in Fig. 1. From these strips after development, the longest time of exposure which did not cause visible fog for each time of bathing could be determined.

### 3. Exhaustion Tests.

For the keeping and exhaustion tests solutions were kept in 2 liter glass battery jars which were deep and narrow and simulated the conditions in a large tank.

## V. THE USE OF PINAKRYTOL GREEN AS A PRELIMINARY BATH FOR DESENSITIZING MOTION PICTURE NEGATIVE AND PANCHROMATIC FILM

### 1. Effect of Concentration and Time of Bathing on Desensitizing.

Various authors<sup>10</sup> have considered the relation between concentration and desensitizing. As Hübl<sup>11, 12</sup> has suggested, it appears that the amount of desensitizing substance which enters the film layer is the determining factor. Desensitizing is very nearly proportional to the concentration of the desensitizing solution, it increases with rise of temperature, and is diminished by anything which retards swelling such as previously hardening with alum. The temperature coefficient of desensitizing varies with the particular dye used.

The desensitizing action of pinakrytol green was measured by the tablet method described above, for various concentrations and times of bathing. The results for panchromatic film are given in Fig. 4 in which desensitizing is plotted against concentration of the dye. Desensitizing is stated numerically as the ratio of the original to the final speed. For these tests the time of the preliminary bath was 5 minutes. The results show that within the range studied desensitizing is directly proportional to the concentration. The curves for the different safelights have no relation to each other in the sense of absolute safety, but each represents the increased safety due to desensitizing for that particular light.

(Continued Next Month)

## Eastman Kodak Stores Open Los Angeles Kodak Building

The Eastman Kodak Stores, Inc., have removed to the new Kodak Building, at 643 South Hill Street, Los Angeles.

The new building is a Class-A structure, with 30,000 feet of floor space devoted to the photographic supply business. The retail salesroom and the professional sales department are located on the ground floor. The second floor is devoted to display rooms for professional photographic apparatus, special stock rooms, projecting room and the general offices. The third floor contains a finishing plant, a repair department, steel die embossing department and a display room for used apparatus. The basement contains stock rooms, storage vaults, and the packing and shipping department.

## International Makes Gain on Earnings During 1925

Earning for 1925 of the industries acquired by the International Projector Corp. were \$756,666, against \$605,519 in 1924, an increase of 25 per cent. The ratio of current assets to current liabilities exceeded six to one, net current assets on Dec. 31, 1925, being \$1,299,578. The International Projector Corp. was formed last year to acquire the entire business and assets of Nicholas Power Company, Inc., the Precision Machine Co., Inc., both of New York, and the Acme M. P. Company, of Chicago.

## Special Representative Joins American Cinematographer Staff

C. K. Phillips, well known in the motion picture trade paper advertising field in Hollywood, has joined the staff of the *American Cinematographer* as special representative.

Before joining the staff of this publication, Mr. Phillips worked as advertising representative on the Year Book, the Laemmle number and other special editions of the *Film Daily*, of which Harvey Gausman is west coast manager.

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☒ **and Dave** I consider the quality of photography as vital to the making of a good action picture or the story. The star or the director

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